

REMARKS

This is a Response to the Office Action mailed June 4, 2007, in which a three (3) month Shortened Statutory Period for Response has been set, due to expire September 4, 2007. Claims 1 and 8-10 are currently amended. No new matter has been added to the application. No fee for additional claims is due by way of this Amendment. The Director is authorized to charge any additional fees due by way of this Amendment, or credit any overpayment, to our Deposit Account No. 19-1090. Upon entry of the amendments herewith, claims 1-16 remain pending.

1. Rejections Under 35 U.S.C. § 103(a)

In the Office Action, at section 2, claims 1-5 and 8-10 stand rejected under 35 U.S.C. § 103(a) as allegedly unpatentable over *Suzuki et al.* (U.S. Patent 6,149,999), hereinafter *Suzuki*, in view of *Harigaya et al.* (U.S. Patent 6,770,346), hereinafter *Harigaya*, *Ohno et al.* (U.S. Patent 6,004,646), hereinafter *Ohno*, and *Hirotsune et al.* (U.S. Patent 6,856,589), hereinafter *Hirotsune*. It is well-established at law that, for a proper rejection of a claim under 35 U.S.C. § 103 as being obvious based upon a combination of references, the cited combination of references must disclose, teach, or suggest, either implicitly or explicitly, all elements and/or features of the claim at issue. See, e.g., *In Re Dow Chemical*, 5 U.S.P.Q.2d 1529, 1531 (Fed. Cir. 1988), and *In re Keller*, 208 U.S.P.Q. 871, 881 (C.C.P.A. 1981).

a. Independent Claim 1

Applicants respectfully submit that independent claim 1, as amended, is allowable for at least the reason that the proposed combination of *Suzuki*, in view of *Harigaya*, *Ohno*, and *Hirotsune* does not disclose, teach, or suggest at least the feature of a “recording layer containing a phase change material represented by an atomic composition formula: $Sb_aTe_bGe_cMn_d$, where ... *d* is **larger than 10** and equal to or smaller than 20,” as recited in claim 1 (emphasis added).

As acknowledged by the Office Action at page 3, *Suzuki* fails to disclose the use of Mn in the recited recording layer. Accordingly, secondary references are required in combination with *Suzuki* to render obvious an $Sb_aTe_bGe_cMn_d$ recording layer where Mn is greater than 10% (and equal to or smaller than 20%).

Harigaya also fails to disclose, teach or suggest at least an $\text{Sb}_a\text{Te}_b\text{Ge}_c\text{Mn}_d$ recording layer where Mn is greater than 10% (and equal to or smaller than 20%). *Harigaya* discloses at most a “composition formula $\text{XaGe}\beta\text{MnySb}\delta\text{Te}\epsilon$ (where X expresses at least one of Ga and/or Sn, α , β , γ , δ , and ϵ expresses atomic percentage, and fulfills $\alpha+\beta+\gamma+\delta+\epsilon=100$) is used as the main component of a recording material. The main component herein means that it occupies 99 wt % or more of the whole recording material and fulfills $0\leq\alpha\leq 5$; $1\leq\beta\leq 5$; $1\leq\gamma\leq 10$; $65\leq\delta<80$; $15\leq\epsilon\leq 25$; and $\alpha\leq\gamma$ ” (column 4, lines 54-61, emphasis added). That is, *Harigaya* discloses that Ge is not larger than 10%.

Hirotsune does not disclose, teach, or suggest using at least a recording film (column 17, line 13 to column 18, line 45) containing a phase change material with an atomic % of Mn larger than 10 and equal to or smaller than 20. *Hirotsune* discloses at most a recording film where Mn can be substituted for Ag (column 17, lines 31-33). Thus, *Hirotsune* is entirely silent as to amounts of Mn used in a recording layer.

Ohno does not disclose, teach, or suggest using at least a recording film (column 17, line 13 to column 18, line 45) containing a phase change material with an atomic % of Mn larger than 10 and equal to or smaller than 20. *Ohno* initially discloses a recording layer where Mn can be used with Sb and Te (column 5, lines 59-66). This portion of *Ohno* relates to a recording layer with *only three* elements. More specifically, *Ohno* discloses a three element recording layer, for which “the composition for the recording layer, a thin film of an alloy of $\text{Mw}(\text{Sb}_z\text{Te}_{1-z})_{1-w}$, where $0\leq w\leq 0.2$, $0.5\leq z\leq 0.9$, and M is at least one member selected from the group consisting of In, Ga, Zn, Ge, Sn, Si, Cu, Au, Ag, Pd, Pt, Pb, Cr, Co, O, N, S, Se, Ta, Nb, V, Bi, Zr, Ti, Mn, Mo, Rh and rare earth elements, is preferably employed” (column 6, lines 5-10). Thus, in this three element recording layer, the amount of Mn (when substituted for Mw in the above composition equation) can be as high as 20%.

However, the recited composition equation of claim 1 is for a *four element* recording layer comprised of $\text{Sb}_a\text{Te}_b\text{Ge}_c\text{Mn}_d$. Thus, the above-disclosed percentage of Mn in the *Ohno* three element recording layer is not relevant to the percentage of Mn in the recited four element recording layer.

Ohno does disclose a four element recording layer at column 7, lines 1-12. However, *Ohno* is limited to disclosing either AgZn or GeSn in combination with SbTe. There is no disclosure whatsoever of the use of Mn in a four element recording layer. The Office Action correctly notes that in the *Ohno* composition equation $Mb_x Te_{1-x} (Sb_y Zn_{1-y})_z$, Mb is at least one member selected from the group consisting of Ag and Zn. Thus, *Ohno* fails to disclose any information regarding Mn in a four element recording layer.

Accordingly, under the proposed combination of *Suzuki*, in view of *Harigaya*, *Ohno*, and *Hirotsume*, one skilled in the art would understand at most that a four element recording layer of $Sb_a Te_b Ge_c Mn_d$, would have an amount of Mn that is 10% or less. The above-proposed combination does not disclose, teach or suggest an amount of Mn that is greater than 10% (and equal to or smaller than 20%).

The proposed combination of *Suzuki*, in view of *Harigaya*, *Ohno*, and *Hirotsume* does not disclose at least the claimed limitations of a "recording layer containing a phase change material represented by an atomic composition formula: $Sb_a Te_b Ge_c Mn_d$, where ... *d* is larger than 10 and equal to or smaller than 20," as recited in claim 1. Therefore, a *prima facie* case establishing an obviousness rejection by *Suzuki*, in view of *Harigaya*, *Ohno*, and *Hirotsume* has not been made. Thus, claim 1 is not obvious under the proposed combination and the rejection should be withdrawn.

b. Problems in the Cited Art of Unbalanced Recording Properties and Deterioration When Mn is Greater Than 10%

The above-described disclosure of *Harigaya* must be considered in total when the percentage of Mn is greater than 10%. *Harigaya* discloses that "the crystallization rate can be adjusted by adding Ga and/or Sn on the basis of a GeMnSbTe-based material" (column 5, lines 53-55). "Mn can raise the crystallization temperature, and does not deteriorate the overwrite property even if added in large amount, and further exhibits satisfying storage property. The increase in the crystallization temperature against adding quantity is small, the initialization prior to recording (the process of phase change from amorphous phase to crystalline phase) is facilitated, and the deterioration in the storage property and repetitive reproducing light emission

can be also minimized. The adding quantity may be determined at 1-10 atomic percentage ($1 \leq \gamma \leq 10$), preferably, 3-7 atomic percentage ($3 \leq \gamma \leq 7$), since the effect is not remarkable with less than 1 atomic percentage, and Mn precipitates without solving when exceeding 10 atomic percentage" (column 5, line 60 to column 6, line 5). Thus, *Harigaya* discloses that Mn precipitates without solving when a percentage of Me is greater than 10%.

Harigaya then goes on to disclose that when the added "quantity of Ga and/or Sn is larger than that of Mn, the crystallization rate improves, on the other hand, the rise in crystallization temperature increases and makes initialization difficult, resulting in unbalanced recording property depending on the position of recording, or the deterioration in the property itself and, further, since the storage property can be satisfied by addition of Mn. Accordingly, the Mn quantity desirably does not exceed the Mn quantity ($\alpha \leq \gamma$)" (column 6, lines 6-14, emphasis added). Here, *Harigaya* discloses that to avoid unbalanced recording properties and deterioration, the amount of Ga or Sn (α) must be "desirably" less than the amount of Mn (γ). If, *arguendo*, one skilled in the art would be motivated to replace the disclosed *Harigaya* Ga or Sn with the recited Ge, it would still hold from the disclosure of *Harigaya* that the amount of Ge (α) must be "desirably" less than the amount of Mn (γ) to avoid unbalanced recording properties and deterioration.

In contrast, claim 1 recites the feature of a recording layer of $\text{Sb}_x\text{Te}_y\text{Ge}_z\text{Mn}_d$, where the amount of Ge is equal to or larger than 4% and equal to or smaller than 10% and the amount of Mn is greater than 10% (and equal to or smaller than 20%). That is, claim 1 recites a recording layer where the amount of Mn is greater than the amount of Ge, which is the opposite of what *Harigaya* discloses. Accordingly, because *Harigaya* teaches one skilled in the art that the amounts of Ga and Sn must be larger than the amount of Mn to avoid unbalanced recording properties and deterioration, *Harigaya* (if modified to substitute Ge with Ga or Sn) *teaches away* from the above-described features of claim 1.

Ohno also recognizes the problems recording mark stability (deterioration) introduced by large amounts of Mn. *Ohno* discloses that "Ag, Zn, Cu, Au, Ag, Pd, Pt, Cr, Co, Zr, Ti, Mn, Mo, Rh and rare earth elements themselves or their compounds with Sb or Te, have high melting points, and thus precipitate as finely dispersed clusters to form crystal nuclei and thus

contribute to high speed crystallization. However, if they are *too much*, they tend to impair the stability of amorphous marks" (column 6, lines 23-29, emphasis added).

Accordingly, one skilled in the art would appreciate from Ohno the nature of the stability problems if the amount of Mn is too large, and thus would further reinforce the disclosure in *Harigaya* of the problems of unbalanced recording properties and deterioration when the amount of Mn is too large (greater than 10%). Therefore, one skilled in the art, based upon the proposed combination of *Suzuki*, in view of *Harigaya Ohno*, and *Hirotsune*, would not be motivated to increase the amount of Mn above 10% so as to avoid unbalanced recording properties and deterioration.

In accordance with *KSR International Co. v. Teleflex Inc., et al.*, 550 U.S. ____ (2007), the secondary factors of a proper non-obviousness test under *Graham v. John Deere Co. of Kansas City*, 383 U.S. 1, 148 U.S.P.Q. 459 (1966) must be considered to properly establish a *prima facie* case for an obviousness rejection. Here, the above-described teaching away of *Harigaya* renders the proposed combination of *Suzuki*, in view of *Harigaya, Ohno*, and *Hirotsune* improper. Further, the above-described disclosure of *Ohno* reinforces the teaching away of *Harigaya*. Accordingly, a *prima facie* case establishing an obviousness rejection by *Suzuki*, in view of *Harigaya, Ohno*, and *Hirotsune* has not been made. Thus, claim 1 is not obvious under the proposed combination and the rejection should be withdrawn.

c. Dependent Claims 2-5 and 8-10

Because independent claim 1 is allowable over the cited art of record, dependent claims 2-5 and 8-10 (which depend from independent claim 1) are allowable as a matter of law for at least the reason that the dependent claims 2-5 and 8-10 contain all features/elements of independent claim 1. See, *e.g., In re Fine*, 837 F.2d 1071 (Fed. Cir. 1988). Accordingly, the rejection to these claims should be withdrawn.

2. Rejections Under 35 U.S.C. § 103(a)

In the Office Action, at section 3, claims 6-7 stand rejected under 35 U.S.C. § 103(a) as allegedly unpatentable over *Suzuki*, in view of *Harigaya*, *Ohno*, and *Hirotsune*, and further in view of *Ohkura et al.* (U.S. Publication 2003/0152006), *Yoshioka et al.* (RE 36,383), and *Ovshinsky* (U.S. Patent 6,011,757). At section 4, claims 11-16 stand rejected under 35 U.S.C. § 103(a) as allegedly unpatentable over *Suzuki*, in view of *Harigaya*, *Ohno*, and *Hirotsune*, and further in view of *Ando et al.* (U.S. Patent 6,519,413).

Because independent claim 1 is allowable over the cited art of record, dependent claims 6, 7 and 11-16 (which depend from independent claim 1) are allowable as a matter of law for at least the reason that the dependent claims 6, 7 and 11-16 contain all features/elements of independent claim 1. Accordingly, the rejection to these claims should be withdrawn.

3. Conclusion

In light of the above amendments and remarks, Applicants respectfully submit that all objections and/or rejections have been traversed, rendered moot, and/or accommodated, and that all pending claims 1-16 are allowable. Applicants, therefore, respectfully request that the Examiner reconsider this application and timely allow all pending claims.

The Examiner is encouraged to contact Mr. Armentrout by telephone to discuss the above and any other distinctions between the claims and the applied references, if desired. If the Examiner notes any informalities in the claims, he is further encouraged to contact Mr. Armentrout by telephone to expediently correct such informalities.

Respectfully submitted,
Seed Intellectual Property Law Group PLLC



Raymond W. Armentrout
Registration No. 45,866

RWA:cl

701 Fifth Avenue, Suite 5400
Seattle, Washington 98104-7092
(206) 622-4900
Fax: (206) 682-6031

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